

THE BLOSSOM WORM, A CRANBERRY PEST¹

BY C. S. BECKWITH

The blossom worm² is a serious pest on cranberry bogs in New Jersey. It works at night so that it has escaped unnoticed many times and possibly the injury it caused was charged to another agent. Dr. J. B. Smith did not mention it in his work "Insects Injurious in Cranberry Culture" printed in 1903. In his "Report of the State Museum, New Jersey Insects" published in 1909 he listed the insect and says that it should be found in New Jersey but evidently he never considered it as a cranberry pest. The species was described by Grote in 1874 from a specimen collected evidently in the adult stage as no food plants are given. The habitat given includes Massachusetts, New York, Illinois and the middle and central states. H. B. Seammell in his "Cranberry Insect Problems and Suggestions for Solving Them" published in 1917 gives a good account of the insect and its occurrence on cranberry bogs.

Mr. A. J. Rider, Secretary of the American Cranberry Growers Association, in his report to the association in 1896 described an infestation of insects which is typical of the blossom worm. He did not have the insect identified but in recent years he has told the writer that it was the blossom worm. Undoubtedly, the insect has occurred for years in New Jersey but the attacks have been so sporadic that the injury and the insect have not been connected sufficiently to allow general recognition of the pest.

The blossom worm is of economic importance more because of the severity of its attacks in isolated cases than because it is present on all bogs every year. Its work is done suddenly and complete destruction of the crop may follow an infestation. Bogs under observation have apparently lost all of their bloom in one night, although the insects had probably been working unnoticed for several nights, and the cutting off of the bloom on the last

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² *Epigleæ apiata* Grt.

night was so obvious that it seemed to have gone all at once. After as severe an infestation as this, a control measure is usually applied and the insect does not appear again for several years.

The blossom worm is listed as a minor pest of cranberries in Massachusetts and is not reported at all from the other cranberry growing regions. The adult moth has been collected throughout the middle and central states but it is not of economic importance on other crops and nothing is known of its feeding habits outside of cranberry bogs.

INJURY

The young worms eat the small young cranberry leaves. At first they eat on one side only, causing the leaf to turn brown. Later they eat chunks out of the leaves usually commencing from the outside edge. They also eat into the terminal buds, consuming the tender interior and causing great loss in fruiting capacity. The large worms are more voracious and often consume entire leaves and at times cut off leaves where they join the main stem. When the new stem is about two inches long, they often attack the lower end, feeding on one side causing the tip to fall over and sometimes actually cutting it off entirely. The occurrence of cut-off and partly cut-off stems in early June indicates the presence of the worms and will be spoken of again under control.

The economic injury from which it gets its name is the cutting off of the blossoms at a point just below where it joins the stem. This, of course, eliminates the possibility of fruit production on the stems where it occurs. Some idea of the extent of the possible injury may be had from the work of ten worms confined to cages and fed fresh blossoms every day. During the season, the worms cut off and consumed an average of seventy-one blossoms per worm and, in addition, cut off but did not consume twenty-one and partly cut off eight more. This work was spread over three weeks. In this case, each worm destroyed about 100 blossoms, enough to make a fair crop on a square foot. In several instances as many as ten worms have been found on a square foot.

After the fruit sets, the worms sometimes eat the small berries although this injury is not usually serious because the worms are normally through eating before much fruit is set.

SEASONAL HISTORY

The insect overwinters as an egg. The eggs hatch rather irregularly in late May and June on bogs where the winter flow was removed May 10. One lot of eggs was held under water until May 10 and then poured out to dry. Three hatched that night. No more hatched until May 24. From then on the record was as follows:

May 24	6	Hatched	June 4	5	Hatched
25	5	"	5	6	"
27	3	"	6	8	"
29	3	"	9	7	"
31	3	"	10	5	"
June 1	5	"	12	9	"
2	7	"	15	4	"
3	12	"	17	1	"

Eggs that had not been held under water at all during the winter hatched between April 27 and June 6, mostly during May. Observations on bogs on which the water was held until May 20 in 1929 showed blossom worms still hatching the last week in June.

This extended period over which blossom worm eggs hatch is rather unusual for cranberry insects. The presence of worms of various sizes on the bog on June 10 has been noted but it was thought that this was due to eggs being deposited at different levels on the bog, thus allowing some to be exposed earlier than others. However, in this experiment, all eggs were held at one level and taken out at one time.

THE LARVÆ

The newly hatched caterpillar is yellowish green in color and about one-seventh of an inch long. It feeds on the buds and leaves but does not consume very much food during the early stages. In the later instars when the worm is about five-eighths of an inch long, the color changes to chocolate brown with a longitudinal light stripe along each side and a dark stripe in the middle of the back. The head is somewhat lighter in color, although it is also dark brown.

The full grown worm is slightly over one and one-fourth inches long.

On a bog from which the winter flow was removed May 10 worms were collected on June 8. Seventy-two were measured and it was found that one was 0.4 of an inch long, nineteen were 0.5 of an inch long, thirty-two were 0.6 of an inch long, fifteen were 0.7 of an inch long, four were 0.8 of an inch long and one was 0.9 of an inch long.

Some of the same catch was placed in cages, one cage to a worm, and fed all that they would eat. They became full grown and cocooned as given in the following table:

COCOONING DATE OF THE BLOSSOM WORM

Date	No. cocooned	Date	No. cocooned
June 28	1	July 9	5
29	1	10	5
30	2	11	4
July 1	3	12	5
2	4	13	5
3	3	14	2
4	5	15	2
5	13	16	2
6	8	17	3
7	7	18	1
8	6		

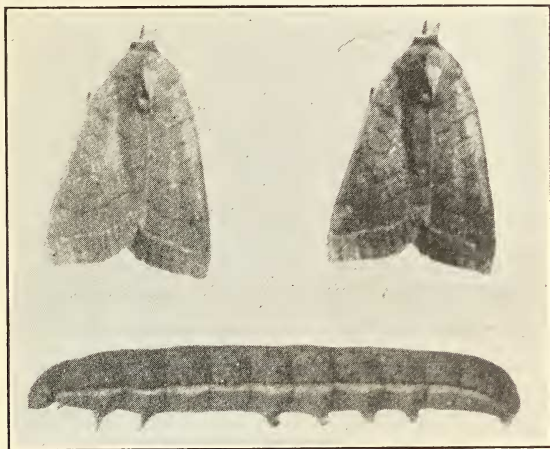
COCOON

The cocoon is a loosely woven web of silk and debris that is formed in the trash on the bog floor. If the trash is not thick they sometimes enter the sand a short distance. They pupate within the same cell before September 1.

ADULT

The adult moths begin to appear early in September, emerge in considerable numbers the last week in September, and are found in greatest numbers during the first week in October. They may be found on badly infested bogs all through October and occasionally in November. They do not fly much during the

day and are often discovered accidentally by being stirred out of the vines by the harvesting operations. Ordinarily, a flight of about ten feet to get out of the way of the scoopers is all that occurs, although flights of 200 feet have been observed. On alighting they crawl among the vines quickly so that they are not easily found.



Moths of the blossom worm (slightly enlarged). Full grown larva of *Epiglea apiata* Grt. (enlarged one third).

At night they are attracted to light to some extent, although not enough to make light trapping successful.

Eggs are laid over a period of two weeks. They are placed singly on dead leaves or small twigs on the bog floor. The female moths confined in cages laid between 100 and 200 eggs apiece.

CONTROL

The first measure of control is to locate the presence of an infestation. The insect does not occur with any degree of regularity so that it would be folly to treat a bog without first determining whether or not it is present.

The worms should be located during the first fifteen days of June if control measures are to be effective. During this period, all unusual activity of birds working among the vines should be

investigated carefully. Localized infestations have often been located in this manner. The cut-off tips of vines, with some hanging so that the undersides of the leaves show, is also a good indication of the presence of this or a similar insect and should be investigated. Other typical feeding marks of the pest will help to locate it.

Finding the worm itself is rather difficult. It rests during the day on a stem and the blending of its color with that of the stem prevents its detection. If disturbed it usually drops to the ground where it may curl up and remain motionless for some time. A grower must be patient to succeed in this search. Doctor Franklin suggests sweeping the vines with an insect net and the writer has taken some worms in this manner. The net is best used in the evening as the worms are starting to feed at that time and are more likely to be near the tops of the vines.

After locating the blossom worm, the control is relatively simple. Two very efficient methods are available for use and the choice may be made to suit the conditions.

Flooding is the simplest method if it can be applied. A twenty-four hour reflow between June 5 and June 10 is ample to kill the worms on a bog. They float to shore or are picked up off the water by the numerous birds that are attracted to the flooded bog. They are usually unable to crawl up out of the water if they have been in it for an hour or more so that many die in the wash at the shore. The treatment has been effective every time it has been under observation in New Jersey. Of course, water for reflooding is not always available and often it cannot be handled quick enough to get the water off before some injury is done to the vines. It is a treatment that must be used with considerable care. It cannot be used safely if the infestation has not been discovered until after the 10th of June, as the bloom is too far advanced to survive prolonged submerging.

The alternate control method is spraying with lead arsenate or other poison. This has been used many times with success in New Jersey and no failures have come under our observation. The lead arsenate should be used without soap, especially resin fish oil soap. Soap spray applied either before or after the

arsenate of lead will cause burning when the two materials come together on the vines.

NATURAL CONTROL

The blossom worm is attacked by numerous birds, the most common of which is the red-winged blackbird. These blackbirds not only destroy a great many worms, but by their activity on the bog indicate the presence of an infestation to the grower.

INSECT PARASITES

Sagaritis oxylus Cresson is a common parasite of the blossom worm. Out of seventy-two worms collected on June 8, twenty-five were parasitized with this insect. All infested worms died before the fifteenth of June and the parasite pupated within the body walls of the dead worm. On June 21 some flies emerged and these were given an opportunity to attack the larger blossom worms. The worms died in a few days but no new brood of flies matured, possibly due to the lack of food for the number of parasites that had to grow in the few worms available. However, even without the second brood, *Sagaritis oxylus* Cresson may be considered a very effective parasite.

This parasite also attacks *Leucania unipuncta*, the army worm, and *Laphygma frugiperda* S. and A., the fall army worm. Our specimens were determined by R. A. Cushman of the Bureau of Entomology.

Euplectrus bicolor (Swed.). This parasite is very small and lives in a group of twenty or more on the outside of the blossom worm. In every collection of worms, a few have been found infested with it. The group, first as a mass of eggs and later as a mass of larvæ, hang on the back near the head of the host. The host dies about the end of June and the adults emerge. This is not a very important parasite but it seems to be present regularly. It was identified by S. A. Rohwer of the United States National Museum.

Rogas sp. (very similar to *Rogas aciculatus* Cress.) is a parasite very common in the worms collected in early June. This parasite kills the host about June 25 and it then crawls outside of the body of the host and goes through its pupal stage in the

dried up skin of the last larval stage. It hangs about a half inch below the leaf or stem on a fine thread. The adult emerges the last of June or early in July. We have no record of this pest entering other hosts but probably it infests other large worms that are common during the summer.

Tachinidæ. A tachinid parasite is quite common on full grown blossom worms. The insect has not been reared because all of the specimens collected were also parasitized with other forms that killed the host before the tachinid was able to complete its life cycle. The eggs of this species are laid just back of the head on the large blossom worm during the latter part of June. Occasionally, two or more eggs are placed on a single worm and in such cases, some of the eggs might be placed on the abdomen. The eggs hatch in a few days and the maggot enters the worm. No emergence records were made.

CONCLUSIONS

The blossom worm has long been a cranberry pest in New Jersey.

Its chief injury is the cutting off of the flowers, often the entire crop being ruined in this way.

It is easily controlled by flooding or spraying if the infestation is promptly located.

Insect parasites are very numerous and they keep the pest from multiplying greatly under ordinary conditions.